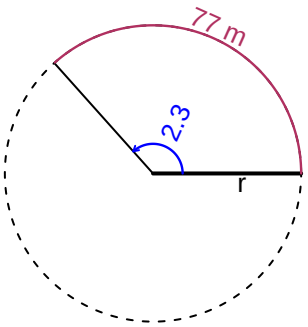
Name: Date:

Trig Final (Solution v16)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The arc length is 77 meters. The angle measure is 2.3 radians. How long is the radius in meters?

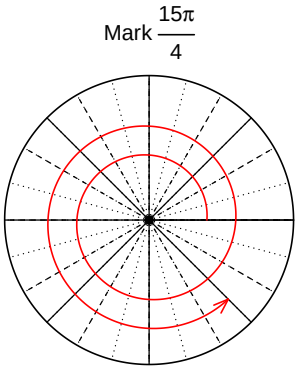


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

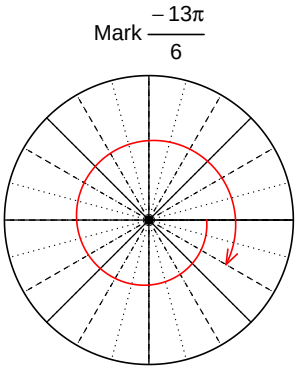
$r = 33.48$ meters.

Question 2

Consider angles $\frac{15\pi}{4}$ and $\frac{-13\pi}{6}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{15\pi}{4}\right)$ and $\sin\left(\frac{-13\pi}{6}\right)$ by using a unit circle (provided separately).



Find $\cos(15\pi/4)$



Find $\sin(-13\pi/6)$

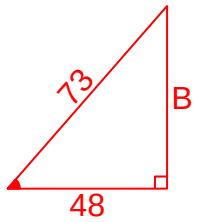
$\cos(15\pi/4) = \frac{\sqrt{2}}{2}$

$\sin(-13\pi/6) = \frac{-1}{2}$

Question 3

If $\cos(\theta) = \frac{-48}{73}$, and θ is in quadrant II, determine an exact value for $\sin(\theta)$.

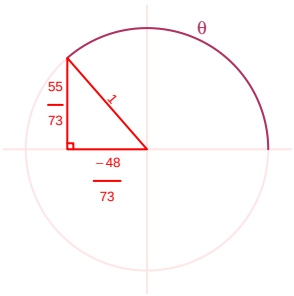
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$48^2 + B^2 = 73^2$$
$$B = \sqrt{73^2 - 48^2}$$
$$B = 55$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant II in a unit circle.



$$\sin(\theta) = \frac{55}{73}$$

Question 4

A mass-spring system oscillates vertically with a frequency of 7.4 Hz, an amplitude of 3.09 meters, and a midline at $y = -4.55$ meters. At $t = 0$, the mass is at the midline and moving down. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -3.09\sin(2\pi 7.4t) - 4.55$$

or

$$y = -3.09\sin(14.8\pi t) - 4.55$$

or

$$y = -3.09\sin(46.5t) - 4.55$$